

ART. IV.—*On the Genus Amathia of Lamouroux, with a Description of a New Species.*

BY THE REV. J. E. TENISON-WOODS, F.G.S., F.L.S., CORRESPONDING MEMB. ROY. SOC., VICTORIA, AND PRESIDENT OF THE LINNEAN SOC., N. S. WALES, &C., &C.

(WITH A PLATE.)

[Communicated 12th June, 1879.]

IN 1877 (4th July) I described to the Royal Society of New South Wales two new species of *Amathia*, under the name of *Serialaria*, which were found on the coasts of Victoria. I have now the honour to draw attention to another undescribed species recently obtained in Port Jackson. It was found by the curator of the Sydney Museum (Mr. E. P. Ramsay) in the systematic dredging operations in which he has been recently engaged, and which have revealed many new forms of marine life. It is to be hoped that before long similar investigations will be carried on in other colonies. Large and important discoveries must infallibly result from them, not only extending our knowledge of the Australian fauna, but also throwing light on the paleontology of our extensive tertiary formations. In this hope we are encouraged by the valuable facts, both for the living and extinct fauna, which even our few dredgings have already revealed.

CLASS POLYZOA.

Order.—Infundibulata; Sub. Or., 3 Ctenostomata, fam. Vesiculariadae.

Genus.—*Amathia*, Lamouroux (Bull. Phil., 1812, Histoire Polyp. Flex., 1816, 157); *Serialaria*, Lamarck.

AMATHIA TORTUOSA, n.s. S. Polyzoary, of a dark and dull olive green colour, in very fine, thread-like tufts; erect; not encrusting or parasitic; about two inches high, dichotomously branching, leaving rather long, slender, cylindrical, smooth, unarmed internodes, which are almost entirely occupied by a double series of about twenty-four pairs of rather high, narrow cells, forming a spiral of not quite one turn round the branch; mouth of cells somewhat crescentic; no setae, spines, or armature of any kind.

This species, which was dredged at various depths from 2 to 16 fathoms, differs from all species known to me in the great length of the pairs of cells in each internode, in the long and slight spiral, and in the absence of any spines or processes.

I take this opportunity of reviewing the whole of the described Australian species, with a notice of the claims which the names bestowed by Lamouroux have upon our attention at the present time.

Flexible Polyzoa, formerly known, and perhaps at the present day more commonly known by the name of Zoo-phytes, have long occupied the attention of naturalists. The history of the various ways in which they have been regarded is not the least interesting part of the bibliography of natural history. It is not my purpose to go into any details in this part of the subject, which one can see dealt with by Lamouroux (*Polypiers Flexibles, par J. F. V. Lamouroux*, 1 vol., 8vo, 19 plates; Caen, 1816), or by Messrs. Edwards and Haime in their historical introduction to the *Histoire Naturelles des Corallaires* (3 vols., 8vo; Paris, 1857).* It is sufficient just briefly to mention the main facts. Marsilli was the first who devoted himself in a special manner to these organisms, which he regarded as plants, in which he was followed by Reaumur, Lemery, and Geoffroy, who also published observations upon them. Aldovrandus, in 1548, and after him every naturalist until Peyssonnel, in 1727, considered all corals and coral animals as vegetable substances. When the latter sent his memoirs to the Academy of Sciences it was disputed by all the learned of his time. He made his first observations at Marseilles, in 1723, and he continued them on the Barbary coast, and then at Guadeloup. He sent them to the Royal Society of London, but it was not until 1752 that they were translated by Watson, the botanist, and published in the *Philosophical Transactions*. The subsequent discoveries of Tremblay entirely melted away whatever doubts there were on this subject. By the time that Linnæus began his work he, with others, seemed still to doubt the animal nature of corals. That illustrious zoologist called them hydras, because of their form. Reaumur, now entirely converted to the views of Peyssonnel,

* There is also an excellent history by Johnston in his *British Zoophytes*, first edition, 1838, written with all the learned vivacity of one of the best English writers on natural history.

called them Polypi. The French Royal Academy of Sciences, wishing to establish the discoveries beyond a doubt, commissioned Bernard de Jussieu and Guetard to make special examinations of marine animals upon the coasts of France. Guetard (says Mons. Lamouroux) ought to be classed amongst the naturalists who have written most upon Polypi; but he is hardly cited by modern authors, although his memoirs are printed in many collections. Though principally engaged upon the fossil forms, he did not neglect those existing in the present day. His two essays on sponges include all that has been written on the subject from the times of Aristotle to his own.

Linnæus commenced to study Polypi in 1744 or 1745. It was he who employed the name of Zoophytes, while his descriptions give grounds for the suspicion (says Lamouroux) that he regarded them as intermediate between plants and animals, and partaking of the nature of both. He was, however, the first who tried to establish definite principles on which their study could be pursued. The method that he established for their classification has been followed, or has served as the type for all who followed him. He determined the principal *genera*, and augmented the number of species, and finally rendered as much service to this province of zoology as he had done to botany by stripping it of all its cumbrous apparel of phrases and synonyms, which rendered its study so difficult and so disheartening.

Lœffling, Butner, Donati, and Roësel published their memoirs about the same time; but all contemporary works sink to insignificance by the side of that of our countryman, Ellis (*An Essay towards a Natural History of Corallines*; London, 1754, 39 plates), a translation of which appeared in France the year following. No work ever gave such an impetus to the subject. It was hailed with acclamation by every zoologist on the continent, both for the fidelity of its descriptions and the beauty and accuracy of the plates. He published subsequently a number of papers on different coral animals and Zoophytes, which are to be found in the 49, 50, 51, 52, 53, 55, 57, 58, and 66 vols. of the *Philosophical Transactions*. Ellis died in 1776, and up to the time of his decease was engaged on another elaborate work, for which many plates had been engraved. It was edited subsequently by Solander* (a pupil of Linnæus) and Sir Joseph Banks,

* Solander died before the work was finished, and it was completed by Ellis's daughter.

under the title of *Natural History of many Curious and Uncommon Zoophytes*. The first six plates of this work were lost after the death of Ellis; the only proofs of them, taken before lettering, are to be found in the Library of the British Museum.

In 1766 was published the *Elenchus Zoophytorum*, by Peter Simon Pallas, in which he united all that had been done before his time, enriched with many valuable observations of his own. He described a large number of new species.* In spite of his belief that Zoophytes were to be considered rather as vegetables than animals, Lamouroux justly calls this the breviary of zoologists who study Polypi. Muller, in 1776, in his *Prodromus*,† gave a description of many Polyzoa, which he subsequently figured, and was followed in this department by Otho Fabricius in his *Fauna Grœnlandica*. I pass over many names—such as those of Parsons, Baxter; Forskæal, Marratti, Dicquemare, Esper, Spallanzani—to come at once to that of Cavolini,‡ whose work, entitled *Memorie per Servire alla Storia dei Polipi Marini*, Naples, 1875, was a valuable contribution to the literature of the subject.

Gmelin, the editor of the thirteenth edition of the *Systema Naturæ* of Linnæus, has made a valuable compilation of all the previous authors, so that the volumes form a very useful epitome at least of the bibliography of the subject. It is a work very commonly met with, as well as the English translation of it in seven volumes by Dr. Turton.§

To Brugière, a physician who was botanist and naturalist to Louis XVI. of France, was entrusted the article *Vers* of the *Encyclopedie Methodique*. This work is justly con-

* He was born in Berlin, in 1741, and commenced his zoological labours at Leyden, where he published his remarkable work. It is an 8vo volume, without figures, but these were added to a Dutch translation by Boddaert, published at Utrecht, in 1768.

† His work is entitled *Zoologiæ Danicæ Prodromus*, but a much more important edition appeared subsequently. This was the *Zoologia Danica*, only the first two volumes of which appeared during his life time. The third was published by Abilgaard, in 1789, and the fourth by Rathke, in 1806. The work is one of the very finest in the department of natural history which appeared in those days. It is illustrated by 160 coloured plates. Otho Fred. Muller was born at Copenhagen in 1730, and died at the early age of fifty-four.

‡ Philippe Cavolini, Professor of Natural History at the University of Naples. Born, 1756; died, 1810.

§ Twice since I have been in the colonies I have seen both these works offered at bookstalls for a few shillings. The work of Gmelin, being in Latin, was offered for 5s., and found no purchaser.

sidered one of the glories of scientific literature in Europe, and being undertaken on such an immense scale, it is truly wonderful, amid the wars, revolutions, and convulsions to which Europe was then subject, how it was ever brought to a conclusion.* In those days of the Linnæun classification *Vers* (or worms) included an important portion of the animal kingdom. *Insecta* and *Vermes* were the two grand divisions of the invertebrate animals. In the latter the testaceous mollusca occupied an order by themselves. The naked tribes were placed in another order along with radiated Zoophytes—annelids, parasitical worms, and the echinodermata. Brugière's part of the volumes was terminated at the word "cone," which completed the first volume of his contribution. He never lived to finish another. He started, in company with the naturalist Olivier, to visit Asia Minor, in order to enrich his work with fresh observations; but he died before this undertaking was completed. The greater part of his notes were subsequently lost in consequence of the premature death of his companion. Brugière attempted an improvement on the system of Linnæus. He divided the *Vermes* into six orders; in the last of which he placed the Zoophytes. He adopted the old genera without proposing new ones. He gives a complete history of the species; and Lamouroux says his synonymy is more exact than that of Gmelin. His efforts in the way of systematising carried zoology onward some steps. He made a distinct class of the star-fish and sea-urchins, under the name of echinodermata (see *Tabular System of the Vermes*, p. 6).

Except for the observations of Renier, Poiret, and Olivi, nothing seems to have been done for the Polyzoa until the time of John Baptist de Lamarck. This most remarkable naturalist was born in Picardy, in 1749. He distinguished himself first in a military career, and then applied himself to the study of medicine, which he soon quitted to devote himself to botany. His first work was the *Flora Francaise*, which appeared in 1773. Another edition, augmented considerably by Alphonse P. de Candolle, appeared in 1805; and a third, with a sixth supplemental volume, in 1815. In 1788 he was attached as botanist to the king's collection; and when this establishment was amalgamated under the

* It is a work of over a hundred volumes. The only Australian copy known to me is in the Melbourne Public Library, presented by Mr. Macgregor, M.L.A.

new title of the Museum of Natural History, he was appointed to a professorship of zoology. He was then fifty years old, being one of the few fortunate eminent men who came through the French Revolution with their heads on their shoulders. He devoted himself with great ardour to the study of zoology. He gave a new classification of the Polypi in his first edition of the *History of Invertebrate Animals*, which is an analysis of his lectures at the museum. He regretted the name of Zoophytes, as being unphilosophical, there being no such thing in nature as animals and plants combined. It may be questioned, however, whether plant animals in some sense are not admitted by men of science at the present day. Lamarek contributed very much to the knowledge of the Polyzoa during his life, which closed when he had reached the goodly term of eighty-five years. For the last few years he was quite blind. In his *Philosophy of Zoology*, published in 1809; in his extracts from the *Cours de Zoologie*, published in 1812; in his *Memoire sur les Polypiens Empatés* (1813), and on the *Polypiens Corticifères* (1815), he made several changes in the classification. I shall deal with this question presently; but I wish now to mention the circumstances which brought the Australian Polyzoa prominently into notice. Up to the close of the last century it was the opinion of naturalists that Polyzoa and small corals and corallines (algæ) did not exist except in the European seas. It was a natural conclusion, derived from the fact that none were brought to Europe from foreign shores. Collectors busied themselves with the large and attractive specimens, and did not trouble about minute things. It was M. Bosc, in his different works, but principally in his *Natural History of Vermes*,* who combated this mistake. He studied the animals of many Tubulariadae, Sertularia, and Aleyons, obtained from the floating weed of the Sargassum Seas of the Atlantic. On the coasts of Carolina, in America, he observed the growth of Gorgonia. He was the first who had the hardihood to say that the East Indian oceans contained Polypi similar to those of Europe, but he only advanced this opinion upon analogy. It was soon confirmed by the collections of Commerson and Sonnerat. But the most important contribution was that of Peron and Lesueur. These

* Printed in 1802, the 18mo edition of works of Buffon, known as the edition of Détérville.

were the naturalists to the French exploring expedition made in "Le Geographe" and in "Le Naturaliste," under Admiral Baudin, in 1800. They visited the whole of the south coast of Australia and Tasmania in 1801-2, and returned to Europe with the largest collection of Australian objects of natural history ever, perhaps, brought home. They could not have come at a more opportune time. Lamarck, Cuvier, DeFrance, Delessert, Persoon, Risso, Labilarchiere, Desfontaines, Dumeril, and Lamouroux were, some of them, in the midst, and others in the commencement, of their labours; and it is to their works we must look for much information about the zoology of our continent. Lamouroux speaks in warm terms of eulogy of Peron, who, he said, was carried away by a mournful death just as he was about to reap the fruits of his labours. He was not long at home before he read to the Institute of France a paper on some new facts in zoology, by which he strove to prove by the difference between the people of Australia and Tasmania that their separation must date back to a very remote period. The fossil corals and shells which he found on the southern portion of the continent seemed to him to him to be analogous to those still existing in the neighbouring seas. He regarded this as a proof of the long duration of the waters of the Southern Ocean over this continent. This fact is an interesting one in our scientific annals. I believe this is one of the first records of any scientific observations on our tertiary formations. Tertiary geology, as such, was not known in those days. If it had been, Mons. Peron would have been able, perhaps, to perceive that the fossils he found were very different from any forms at present existing in our seas.

Peron, also, was the first to prove that no large species of solid coral was found beyond the 34th degree of south latitude. Further south than this he states that he found only *Gorgonia*, sponges, *Isis*, &c. He says, moreover, that this rule, noted first by him in the northern hemisphere, was found to be equally applicable to the southern, which he confirmed by bringing home a rich supply of specimens, and about a hundred species of Polyzoa, mostly new to science.

After the death of Mons. Peron, his work was in part carried on by M. Lesueur, in conjunction with Mons. Desmarests. The Polyzoa were handed to Lamarck for description, who allowed the fullest access to them to J. F. V. Lamouroux. This illustrious naturalist was born at Agen,

in Languedoc, in 1779, and was at first a shopkeeper; but from the assiduity with which he gave himself to the study of botany, was nominated Professor to the Faculty of Sciences at Caen. His first work of any pretension is the *Histoire Generale des Polypiers Coralligenes Flexibles*, 1 vol., 8vo; Caen, 1816. Another amended work, entitled *Exposition Methodique des Genres de l'Ordre des Polypiers*, was published in 1821, and in this we find reproduced the beautiful plates of Ellis, which Solander edited.* There has been but scant justice done to Lamouroux, and his engravings have been found fault with. For my part, I must say the figures seem to be excellent, and executed with fidelity. For the smaller species, no doubt, allowance must be made for the imperfect microscopes at the disposal of naturalists; and thus, it may be, that the more minute organs were misunderstood. It may be, also, that some of the species will never be recognised. On the whole, every one must admit that the work of Lamouroux is one of the very valuable contributions to the knowledge of Polyzoa which appeared in the commencement of this century. It is not my intention to institute a comparison between his work and that of Lamarck. As far as the value of the systems goes, this has been very ably and satisfactorily done by Dr. George Johnston, in his admirable *History of British Zoophytes*, Vol. I., p. 446.† It is sufficient for us to know that neither system is followed now, though the names of Lamarck for the most part survive. In one respect, however, I think that the accuracy of Dr. Johnston seems to be at fault. He places the system of Lamouroux with the date 1821 above it, and the system of Lamarck with the date 1816; but the first publication of Lamouroux was long anterior to that of Lamarck. The history of it is this:—In 1810 Lamouroux presented his first memoir on this subject to the Institute of France. In 1812 he sent to M. (afterwards Baron) Cuvier the duplicates of his collection, and he named the collection of M. de Lamarck for him, and, as he himself says, communicated his observations to several friends of his who were naturalists. In 1813 he sent to Mons. Bosc a more complete system of classification for

* Lamouroux died in 1825. Blainville, who blames his drawings, was not above copying a good many of them.

† A book which is almost as useful in Australia as in Europe. Full of observations of the highest interest. London, Van Voorst; 2 vols., 8vo, 1847.

these animals, in order that it might be submitted to the examination of the members of the academy. A commission was appointed to examine this, and the system was approved of. In three different reports, and in an analysis which Baron Cuvier made in 1815, the author was requested to publish his work as soon as possible. This he did in 1816, but his system dates many years before that of Lamarck on these organisms had seen the light. Now, though in his subsequent edition of 1821 Lamouroux made some additions and changes, yet the bulk of his generic names and definitions were made before those of Lamarck, and, therefore, he is entirely entitled to priority.* In the first section of his flexible Polypi we have five orders. In the fourth—the Sertularians—we have the following definition:—Sertulariæ.—Polypidoms phytoid, with a distinct or branched stem, rarely articulated, almost always fistular, full of a gelatinous animal substance, in which the lower end of each polypi is fixed in a cell whose position, form, and size is variable. In this order we have the following genera:—*Pasythea*, *Amathia*, *Nemertesia*, *Aglaophenia*, *Dynamena*, *Sertularia*, *Idid*, *Entalaphora*, *Clytia*, *Laomedea*, *Thoa*, *Salacia*, *Cymodocea*, *Amphitoita*. All these, with the exception of the last and *Entalaphora*, were named and defined before 1816. The second of them is *Amathia*, which is thus defined:—

AMATHIA†.—Polypidom ramose, cellules cylindrical, elongate, united in one or many groups. (Extrait d'un memoire sur la classification des Polypiers, coralligenes, non entiere-ment pierreux, presente a la premiere classe de l'Institut de France, en Fevrier, 1810, par M. Lamouroux.) But the definition of this particular *genus* was in *Nouveau Bulletin Philomatique*, December, 1812.

* Monsieur Blainville admits this; and I believe he was the first naturalist who gave Lamouroux the credit of the species which he named—a credit which Lamarck, who used his names, did not acknowledge. In the second edition of Lamarck, Messrs. Edwards and Deshayes, who edited this portion conjointly, did not admit Lamouroux's claims. I believe I am safe in saying that all this portion of the work was done by Milne Edwards, who does not seem to have examined Lamouroux's work closely. Blainville says:—"This division (*Sertularia*) of Sertularians has been established by M. de Lamarck and M. Lamouroux, almost at the same time, under different names. I have preferred the name chosen by Lamarck to that of *Amathia*, employed by Lamouroux, as more expressive and more in harmony with the other *genera* dismembered from the Sertularians."—*Manuel d'Actinologie*, p. 476. He thus quietly passes over the question of priority.

† Etymology.—One of the Nereids, according to Homer. Query.—From *ἄμθος*—sands of the shore.

The following is a translation of the remarks of Lamouroux on his genus:—" *Sertularia* (*Auctorum*), *Amathia lendigera* (*Sertularia lendigera* of Linné) is the only species of this genus mentioned by authors. All have regarded it as a *Sertularia*, although the figures given by Ellis, Cavolini, and others, ought to have sufficed to separate this Polype from the genus. The *Amathias*, by their numerous cells, by their horny stem, which is fistulous and filled during life with an irritable gelatinous substance, present the general characters of all the *Sertularia*. They differ from the *Polypi* of the order by their general *facies*, their ramification, the form of the cellules, and their respective situation. In some species the cellules are united into isolated groups, which resemble Pandean pipes, with tubes of variable length. In others, all the groups touch, but are easy to distinguish by the unequal length of their cells. Some present all their poly-piferous chambers united by their sides, and forming spiral salient lines around the stems, to which they adhere by their lower portions. Finally, there are some in which the lines of cells are not projecting from the front, but are attached to the stem by the posterior part of the cellules. Thus, notwithstanding the difference which is observed between *A. lendigera* and *A. spiralis*, it is impossible to erect special genera for them, as there are intermediate species which connect those which at first sight appear so very distinct.

"No specific character can be derived from the distance by which the cells are separated from one another. In *A. lendigera*, so common in our seas, we find individuals in which all the groups touch, and others when the same groups are four or five millimetres apart. In the number and the form of the cells of each group, in their situation, ramification, &c., we find the characters by which the species can be distinguished. The *Amathias* are of a horny substance, which is only slightly calcareous. Their colour is a more or less deep yellow brown or fawn colour. Their size varies from 1 to 15 centimetres. They are often found parasitic upon *Thallassiophytes*; sometimes they adhere to rocks and other solid marine objects by a fibrous attachment. They appear more common in the temperate or equatorial regions, than in the icy or cold regions of the poles. They are not used for any purpose."

Lamouroux goes on to describe the species, and I shall give his diagnosis and synonymy in his own words:—

265.* *A. Lendigera*.—Ramosa, filiform cellules with an entire margin; groups at unequal distances, which are sometimes great. *A. Lendigera*; *articulata*, *sub-dichotoma*, *implexa*; *denticulis cylindricis*, *secundis*, *parallelis*, *ad genicula minoribus*; *ovariis* . . . Sol. et Ell., p. 52, n. 25 (*Sertularia*); Pall. Elen., p. 124, n. 73; Gmel, syst. nat., p. 3854, n. 20; Bosc. 3, p. 99; Rai. Syn., p. 38, n. 3; Ell. Coral., p. 43, n. 24, fig. 6, B., tab. 15; Cavoll. Pol. Mar. 3, p. 229, tab. 9, fig. 1, 2; Esper Zoop., tab. 9, fig. 1, 2, European seas. (Cavolini gives very interesting details on this species.) To these must be added, from Deshayes and Johnson—Lamouroux Expos. Meth., p. 10; Ency. Meth. Zooph., p. 43; Schweigger Handb. der Naturgeschichte, p. 426 (as *Serialaria*); Lam. Hist. Nat. d. Anim. s. vert., first edit., March, 1816, Vol. 2, p. 130; Cuv. Reg. Anim., second edit., tom. 3, p. 301; Fleming Brit. Anim., p. 547. *Sertularia lend.*—Delle Chiaje. Anim. senza. vert. di Napoli., t. 4, p. 146, pl. 63, fig. 6, et 16; Oliv. Zool. Adriatic., 289; Turton's edit. Gmel., Vol. 4, 682; Berk. Syn. 1, 218; Stew. Elem., Vol. 2, 445; † Wern. Mem., Vol. 1, p. 564; Turt. Brit. Faun., 215; Bosc Vers., t. 3, 117; Hogg's Stock, 33; Lister Phil. Trans., an. 1834, 384; Lam. Desh. edit., 2, 169; Risso. Eur. Merid., 5, 315; Stark Elem., 2, 439; Templeton Mag. Nat. Hist., 9, 467; Couch Zooph. Cornw., 37; Blainville Actinol. 476, pl. 83, fig. 2; Couch Cornw. Fauna., 3, 94, pl. 16, fig. 4; Busk. Eng. Cycl. Art. Polyz., Vol. 4, p. 430, *Serialaria* genus; Tenison-Woods Proc. Roy. Soc., N.S.W., 1877 (Vol. 11), p. 83.‡

266. *A. cornuta*.—The largest cellule of each group, with a free margin, furnished with two setaceous appendages.

A. c.; 2 *filamentis setaceis ad cellulam primariam*. On *Fucus* in Australasia.

Serialaria cornuta.—Lamarck, first and second editions, but with a reference to Lamouroux only, by Mons. Deshayes

* The numbers refer to his own list of species.

† The number of Polyzoa described in this work is considerable, and it is particularly useful for its Latin glossary.

‡ I have figured here Busk's drawing of the cells of *A. lendigera*, from which it would seem that the cells are grouped, and not a single series, as represented by all previous observers. This fact should convince us that unless we have the type specimens it will be impossible to identify any of the old species. First of all the descriptions are too brief to be any guide; and, secondly, the imperfect microscopes of that time render the figures untrustworthy. It is astonishing how one author follows another without question. Cavolini, Esper, Blainville, and even Dr. Johnston, all copy the figures of Ellis, which represent a single series of cells.

in the second edition, with these words added—Mus. No. Hab. (?), Asiatic Ocean. I believe it came from the voyage of Messrs. Lesueur and Peron. It is a little stouter and less capillary than the preceding, with the extremities bent, and, as it were, crisped (*frisées*).

In the first edition of Lamarck, the author makes no reference to Lamouroux, though he uses a name which that naturalist had given him. He says, also, that it came from Australasia, and was in his cabinet. Mr. M'Gillivray was of opinion that my *Serialaria australis* was the same species. I have copied Lamouroux's figure (pl. 4, fig. 1, edit. of 1816), from which it will be seen that his species is entirely different, not only because the cells are in a single series, but because the setaceous appendages are of quite a distinct form. Lamouroux's true *S. cornuta* has, I believe, been lately found at Port Jackson, where it is very common. It is fairly represented by his figures, of which a copy is here given.

267. *A. unilateralis*.—Branches bent inwardly, groups of cells very close, almost touching, and placed on the same side.

A. v., ramis arcuatis, conglomerationibus cellularum approximatis, unilateralibusque. Mediterranean Sea. Ded. Balbis.

Serialaria unilateralis.—Lam. loc. cit.; also Lamouroux, Esposit. Meth., p. 10, pl. 66, fig. 1 and 2; Ency. Meth. Zooph., p. 43. M. Deshayes adds (second edit. Lamarck, p. 170)—Inhabits the Mediterranean coast. M. Blainville regards this species as a true *Plumularia* (Manuel, p. 476). But this opinion appears to me altogether inadmissible. This species is not mentioned by Lamarck.

268. *A. alternata*.—Lamouroux.—Very much branched, groups of cells, very long alternate on the branches, and very close; cellules numerous, of equal size. *A. a. ramosissima, conglomerationibus cellularum alternatis, approximatis, cellulis numerosis, subaequalibus.* American Seas. The Antilles, Deshayes.

Expos. Meth., p. 10, pl. 65, figs. 18 and 19; Encyclop., p. 44; *Serialaria alternata*, Deshayes, Lam. loc. cit.

269. *A. convoluta*.—Lamouroux Poly. Flex. p. 160.—All the cells united, and forming one single, exsert group, twisted in a spiral manner round the stems and branches.

A. c. cellulis coalescentibus; conglomeratione cellularum eminente, contorta; Australasian seas.—Encycl., p. 44.

Serialaria crispa.—Lamarck, first edit., n. 4, p. 131, Vol. 2., M. Edw. and Desh; Lamarck, second edit. *S. convoluta*.—Blainville, op. cit., p. 476. They add seas of New Holland. Peron and Lesueur.—My collection (Lamarck's) a little smaller than the preceding (*A. spiralis*, Lamouroux). It is ramose, paniculate; its spiral is less regular, wider, plicate, almost fringed, and sometimes interrupted.

270. *A. spiralis*.—Lamouroux.—Ramosé, dichotomous; cells forming a single group, spirally twisted round the axis, and adhering by the internal pores of the cells. *A. s. ramosa dichotoma, cellulis coalescentibus, conglomeratione spirali, facie interne axi adherente.* Australasian seas. Peron and Lesueur.

Serialaria convoluta, Lamarck, first edit., Vol. 2, n. 3, p. 130; second edit. (Milne Edw. and Desh.), Vol. 2, p. 171; Lamouroux Expos. Meth., p. 10, pl. 65, figs. 16, 17; Encyclop., p. 44; *Serial. conv.*, Schweigger, op. cit., p. 476; *Serialaria spiralis*, Blainville, op. cit., p. 476. Lamarck adds:—"My collection, stem from 15 to 18 inches long, sustaining alternate branches, which are simple filiform, surrounded by a clasping, spiral, continuous series of coherent cells."

I have reproduced the figure given by Lamouroux. It has a slight resemblance to my *A. bicornis* (*Serialaria spiralis* * *nobis*), but the cells are unarmed, and attached by their inner wall. I have not seen this species; but as there seem to be so many in Australia, and as a good number of those enumerated as gathered by Peron were found in West Australia, or near the Bight, probably this will still be found.

The following species not described by Lamouroux in his first work (though mentioned in his *Exposition Methodique*), are described by Messrs. Milne Edwards and Deshayes in the second edition of Lamarck.

A. acervata.—Lamouroux.—*S. pumila, parum ramosa, subdichotoma, ramis capillaceis, tenuissimis, cellulis subdisjunctis in massam distinctam distanterque congregatis.* *Serialaria acervata*, M. Ed. and Desh. Lamk., op. cit., p. 170; Blainv., op. cit., p. 476. In form the groups of cells are distant a millimetre from one another. They are composed of nearly 20 cells, heaped without order around the subdichotomous stems, which are not much branched, and isolated during the greater part of their length.

A. precatoria.—Lamouroux.—*S. caespitosa, ramosissima;*

ramis elongatis, ramosis, tenuissimis, conglomerationibus cellularum ovalibus, distinctis, preicatoriis, cellulis subsejunctis, aliquoties unilaterialibus.

Lamx. Encyclop., p. 45; *Serialaria*, p., Blainv. op. cit. p. 476. Found on the coast of Brittany. Desh. and M. Ed., loc. cit.

A. semi-convoluta.—Lamouroux.—Encyclop., p. 44. *A. ramosa, capillacea, ramis sparsis conglomerationibus cellularum longissimis, distinctis convolutis vel semi-convolutis.*

Serialaria, semi-convoluta, M. Ed. and Desh. loc. cit. They add—Hab. Medit. Sea. This species establishes the passage between two species of *Serialaria*. The stems and the ramifications are filiform or capillary; the groups of cells are very distinct although near, and the cells themselves are all the same length.

A. australis, nobis, Proc. Roy. Soc., N.S.W., loc. cit. Polyzoary, with the internodes completely occupied by 7 to 10 tubular cells, adnate to one another perpendicular to the frond, curved and lengthening towards the end of the series. Internodes serial or giving off two others at right angles. Two long ligulate processes proceeding apparently from the terminal cell-mouth of each internode, and about twice their length. Mouth of the cell somewhat crescentic, with a thickened margin.

A seaweed, Guichen Bay, S.A., of a light brown colour, and very like a mass of aphides, branches corrugated, and constricted at the internodes. Some of the cells have a conical cap. Nearly all the cells in a double series. *Serialaria australis*, nobis, loc. cit.

Amathia Bicornis, nobis. Op. cit. p. 84, as *Serialaria spiralis*. P. dichotomously branched with clusters of cells in series of 20 to 24, disposed spirally round the axis of the branches. Cells attached by their bases only, nearly four times as long as wide, each provided with two divergent hollow spirals half as long as the cell,

Darker in colour than the preceding—*Amathia Woodsii*, Goldstein, Proc. Micr. Soc. Vic., 1879.

It would seem from the confusion between the works of Lamouroux and Lamarck, and the identity of some of their names, as if there had been some misunderstanding between them. It is, however, pretty certain that Lamarck does not acknowledge Lamouroux's assistance, or admit that he was using his names. This is all the more strange, if we remem-

ber that at the same time Lamarck was in the height of his fame, and in the decline of life (he was 72), while Lamouroux (then 37) was struggling into notice as a professor in a remote provincial town. It seems somewhat unaccountable to me that so many zoologists in succession should have admitted Lamarck's names without a question. This arose from the dates of the two works being the same, and probably Lamarck's being published earlier in the year, since he was careful to put the date of March on his second volume. Naturalists forgot, however, that Lamouroux's *genera* were published four years previously in the *Bulletin*, to which he refers. It is true that Lamarck's definition is much more precise and definite; but yet he misunderstood these organisms, as he placed them next to *Plumularia*. His generic definition is as follows:—*Polyparium phytoideum, corneum, surculis gracilibus, fistulosis, ramosis, calyciferis, calyces cylindranei, prominuli, paralleli, seriatim coherentes, in massas distinctas vel in spiram continuam dispositi.*

The remarks of Mons. Edwards in the second edition, showing how well he understood these organisms, are as follow:—"These polypi differ very much from the *Sertulariæ Campanulariæ* and *Plumulariæ*, and appear to me to have the same kind of organisation as *Cellularia* and *Flustra*. The tentacles are furnished on each side with a linear series of vibratile cilia, and the mouth opens upon an alimentary canal, which is bent on itself, and curves round so as to terminate on the external side of the orifice which bears the tentacles. *Serialaria* consequently belong to the *Bryozoa*."—*Op. cit.*, p. 169.*

Before concluding this paper I may as well give a general outline of the progress of the knowledge of the Polyzoa from the time of Lamarck. He was followed in the matter of classification by Dr. Auguste F. Schweigger in 1820 (*Handbuch der Naturgeschichte, Leipzig*), who made important changes, but not for the best. He unfortunately perished during his zoological explorations in Sicily. The *Manual of Natural History* of Goldfuss appeared about the same time; but with few exceptions this was not successful as an attempt at systematising. Lamouroux's second work, to which reference has often been made,

*It must not be thought that I wish unduly to exalt Lamouroux. As a systematist he was a failure. See *Blainville Manuel d'Actéonologie*, p. 54; Johnston's *Brit. Zooph.*, second edit., Vol. 1, p. 448.

followed in 1821. Latreille made another attempt in 1825 in his *Families of the Animal Kingdom*. It is said of this that he only borrowed from Messrs. Cuvier, Lamarek, and Lamouroux. Gaillon and Bory St. Vincent followed, and then Dr. Fleming was the only British naturalist who tried his hand at the arrangement of Zoophytes;* but though he knew his subject well, and made some valuable discoveries, yet his method, as well as that of Oken and Van der Hoven, have long been forgotten. I will only say of the latter that I know of no work that contains such marks of extensive reading, or where there are such copious references to the bibliography of the subject, as in his essay on the art of classifying.†

At the same period Prof. Grant (1827) made important researches into the anatomy of Flustræ, which were followed by those of Milne Edwards in 1828. About this time Mr. J. V. Thompson proposed the establishment of a separate class, which he named POLYZOA. Prof. Ehrenberg subsequently (in 1834) suggested the name *Bryozoa*. In 1836 Dr. Johnston, the author of *British Zoophytes*, proposed that the primary sections of zoophytes should be named *radiated* and *molluscan*.‡ The latter were embraced in one order. The *M. Ascidioida*, a name intended to point out its immediate affinity with the *mollusca tunicata* and the radiated zoophytes, were divided into three orders, the same as those of Milne Edwards, but designated the *Hydroïda*, *Asteroida*, and *Helianthoida*, names which have been adopted by naturalists in general. In 1840 Mr. J. Hogg proposed a different classification of the zoophytes, founded on the structural peculiarities of the tentacula.§ In 1843 Prof. Owen, in his *Lectures*, proposed to divide the radiated zoophytes into two classes—the hydrozoa and anthozoa—which latter was made to include the orders *Asteroida* and *Helianthoida*.

I do no more than refer my readers to the whole series of the *Annals of Natural History* for the successive labours of Messrs. Alder, Allman, Albany, Hancock, Wyville Thompson, Busk, and others. The *Philosophical Transactions* contain Dr. Farr's valuable papers. The names of Dr. Bowerbank, Sir J. G. Dalzell, Sars (Fauna Novegæ), Van

* *History of British Animals*, Edinburgh, 1828.

† Van der Hoeven's *Zoology*, translated by Dr. Clark, 2 vols, London, 1856.

‡ *Magaz. Zool. and Bot.*, Vol. 1, p. 447.

§ *Ann. Nat. Hist.*, Vol. 4, p. 366.

Beneden, and Peach, can only be mentioned, as their labours must be familiar to all who are interested in the subject.

One of the most important steps ever made to a complete arrangement of the Polyzoa was that published by Dr. Busk in the *English Cyclopædia*, conducted by C. Knight,* and published in 1856. The same author had already published, in 1852, the first part of a catalogue of the Marine Polyzoa contained in the collection of the British Museum. Between the publication of the first part and the third in 1875, an immense number not only of *genera*, but species, have been created by various authors. Even to name a few, such as Landsborough, Gosse, Hincks, Norman, D'Orbigny, Hassal, Couch, Smitt, Gray, Lister, Macgillivray, Hyndman, Heller, Fritsch, Forbes, Meneghini, Kirchenpaur, will show how the subject has grown. In the meantime warning notes are reaching us from every side that the present system of classification is founded on very unstable ground. For the great divisions probably there would be but little change, if any, suggested, but for the smaller divisions, and especially the *genera*, as the animals are better known and their mode of grouping or building their frail tenements understood, some of the generic distinctions are fading away. The master-mind that will grasp the whole is yet to come, and we have only to fear now that amid the multitude of workers it will be very difficult to arrive at some common bond of agreement which all naturalists will accept. It appears, however, that there is a general disposition to accept a system of classification such as Professor Lankester has put forth. Thus Polyzoa are divided into the sub-classes:—1, Holobranchia; 2, Pterobranchia. The first into groups—Ectoprocta, which is divided into the orders Phylactolæma and Gymnolæma, &c., &c. There is at the same time evidence of various schools which will represent the views of Lankester, Hæckel, or Huxley, as the case may be.†

I must not close this article without referring to the persistent labours of the Rev. Thos. Hincks, F.R.S. He has given himself so entirely and successfully to the study of the Polyzoa that Australian species have already received much elucidation from him. At the same time, his descriptions are so full and satisfactory, and his drawings so

* *Natural Hist.*, Vol. 4, p. 415.

† See "On Germinal Layers," &c., *Ann. Nat. Hist.*, May, 1873; and "On Embryology and Classification," *Quart. Jour. Micros. Sc.*, Oct., 1879, p. 393.

accurate and artistic, that his work forms a new area in this study of these organisms. They will no longer be so beset with difficulty as they have hitherto been if his example is followed.*

EXPLANATION OF PLATE.

FIG. 1.—*Amathia lendigera*.—Linn, after Ellis.

FIG. 2.—Ditto, cells much magnified, after Busk; a. a., armature of mouth.

FIG. 3.—*Amathia cornuta*.—Lamx., copied from the fig. in Polypiers flexibles, pl. 4, fig. 1.

FIG. 4.—*Amathia spiralis*.—Lamx., from fig. op. cit., pl. 4, fig. 2.

FIG. 5.—Same, nat. size; from the same.

FIG. 6.—*Amathia tortuosa*.—Tenison-Woods.

* See especially "Notes on the Genus *Retepora*," *Ann. Nat. Hist.*, May, 1878, p. 353; on "Polyzoa from Iceland and Labrador," Jan., 1877, p. 97.

A P P E N D I X.



LIST OF AUTHORS WHO HAVE WRITTEN DIRECTLY
OR INDIRECTLY ON POLYZOA.



THE following list, I venture to hope, will be of use in Australia, and worthy of a place in the transactions of the Royal Society of Victoria. It is the result of notes made during many years' study of natural history in Australia. I have so often felt the want of some reference to works, when no more than the author's name was given in scientific writings, that I cannot doubt its usefulness to students. It may help, also, as a guide to researches in our public libraries, and may be the means of introducing many of the works here named, not only to students, but to the colonies where they are not yet to be found :—

ADAMS, John.—Descrip. of some Marine Animals Found on the Coast of Wales ; Trans. Lin. Soc., Vol. 5, p. 7. London, 1798.

ALDROVANDUS, Ulysses.—Museum in Libros, 4 distrib. Bologna, 1648. There is a copy of this work in the Sydney Museum.

ALDER, A.—M. Nat. Hist., 1856, pp. 353, 439.

ALLMAN, G. J.—Proc. R. Irish Acad., 1843 ; Do., 1850 ; Ann. Nat. Hist., Vol. 13, 1844, p. 328 ; Rep. Brit. Assoc., 1849, p. 71 ; L'Institut., Vol. 18, No. 837, 1850, p. 19 ; Brit. Ass. Rep., 1850, p. 305 ; a Monograph of the Fresh-water Polyzoa, including all known species, printed for the Roy. Society, London, fol, with 11 plates ; Homology of Polyzoa ; Transact. Roy. Irish Academy, Vol. 22, p. 3, 1852 ; p. 275, Vol. 5 ; 1850, p. 237.

ARGENVILLE D', A. J.—L'Historie Naturelle éclaircie dans deux de ses Parties Principales, la Lithologie et la Conchyliologie, &c. Paris, 1752, 4to, plates.

ARCHIAC D'.—In Memoires of the Geol. Soc. of France Generally.

ARISTOTLE.—Historia Animalium. Bohn's edit. and translation.

AUDOUIN, Victor.—Ann. des Sc. Nat. Generally.

AUDOUIN, Victor.—Recherches pour servir a l'Hist. Nat. de France ; 2 vols, 8vo, 1832-34.

BAKER, Henry.—A Natural History of the Polype. Lond., 1743, 8vo, plates.

BARREL, A. R. P.—Jac. Icones Plantarum per. Galliam Hispan. et Ital. obs. op. Posthumum, by A. de Jussieu. Paris, 1714, 4to, plates.

- BARROW, J.—Travels in S. Africa in 1797 and 1798 ; 8vo. London.
- BARTHOLINI, Stephanus.—Acta Medica and Phil. Hafniensia. Copenhagen, 1672-79, 4to, plates.
- BASTER, J.—Observationes de Corallinis Philosoph. Transac.; Vol. 41, Lond; and Opuscula Subseciva obs. Miscellaneas de Animalculis et Plantis Marinis. Harlem, 1759-65, 4to, plates.
- BAUHINI, Caspar.—Pinax. Theatri. Bolanici sive Index, Theophrastii, Dioscoridii, Plini, &c. Bâle, 1623, 4to.
- BAUHINI, Caspar.—Historia Plantarum. Embrun, 1650, fol, plates.
- BERAUD, J. J.—Mem. sur. le Corail. Acad. de Marseille Mem., Vol. 17, 1787.
- BERNARD.—Dictionnaire Universel Les Fossiles, 1763, 4to.
- BERTOLINI, Ant.—Rar. Ital. plant. Accedit, Specimen Zoophytorum. Pisa, 1810, 8vo.
- BESLERI, M.—Rup. Gazophylacium Rerum Naturalium ex Regno Veget. Animali et Minerali. Nuremberg, 1642, et Leipzig, 1733, fol, plates.
- BEUDANT, M.—Mein. sur. Mollusques; Radiates et Zoophytes, 1810; Annales du Mus d'Hist. Nat., Vol. 16, p. 71.
- BOCCONE, Paul.—Recherches d'Hist. Nat. touchant le Corail. Paris, 1670; Amsterdam, 1674, plates.
- *BOCCONE, Paul.—Museo di Fiscia e di Esperienze Variato et Decorato di Osserv. Nat., &c. Venice, 1677, 4to, plates.
- BOERHAAVE, Hermann.—Index alter Plantarum Lugduno-Batavi; Leyden, 1720, 4to. Index Plantarum in horto Leidense; Leyden, 1720, 4to.
- BOHADSCH, J. Bapt.—De Quibusdam Animalibus Marinis. Dresden, 1761, 4to, plates.
- † BONANI, Phil.—Museum Kircherianum. Rome, 1709, 4to, plates.
- BORLASE, Rev. William, F.R.S.—Natural History of Cornwall. Oxford, 1758, fol, plates.
- BOROWSKI, G. H.—Natural History. Berlin, 1780-89, 10 vols, 8vo, 450 coloured plates.
- BORY, St. Vincent.—Essais sur les iles Fortunees; Paris, 1802, 4to, plates. Voyage dans les isles d'Afrique; Paris, 1804, 8vo, plates.
- BOSE, J. A. G.—Hist. des Vers. Buffon, edit. de Deterville. Paris, 1802, 18 plates.
- BOUVIER.—Analyse de la Coralline; Ann de Chimie, Vol. 8, p. 308.

* Lamouroux says of this book that the plates are badly engraved and almost useless.

† This work first appeared in 1684, and another edition, by Contuccio, in 1765, fol., 45 plates.

BOYS, Henry, F.L.S.—Account of *Flustra Arenosa* and other Marine Productions, trans. Linn. Soc., Vol. 5, p. 230.

BRADY.—Philos, trans, Vol. 49, p. 249, plates.

BREYN, Jac.—*Prodromus Rariorum Plantarum*. Dantzic, 1739, 4to, plates. This is another edition by Philip Breyn of the works of his father published in 1678-89.

BROMEL, V.—*Mineralogia and Lithographia*. Stockholm, 1740, 8vo, plates.

BROWN, Patrick.—*Civil and Nat. Hist. of Jamaica*. London, 1756, fol, plates.

BRUGIERE.—*Histoire Naturelle des Vers Encyclopedie Methodique*. Paris, 1789, 4to.

BRUGIERE.—*Tableaux Encyclopedique des trois Regnes de la nature ou sout Figurés les Vers*. Paris, 1791, 4to, plates.

BUSK, Geo., F.R.S.—*Catalogue of Polyzoa*, Part 1, 1852; Part 2, 1854; Part 3, 1874. London; portion of Brit. Mus. Catalogue. *Polyzoa of the Crag*; *Paleontographical Society's Memoirs*, 1857; *Quart. Jour. Geological Society*, 1860, 16, p. 261; *Quart. Jour. Microscop. Soc.*, Vol. 7; *Polyzoa of Natal*; *Rep. Brit. Ass.*, 1850, p. 118.

BUTTNER, Sigism.—*Coralliographia*. Leipzig, 1714, 4to, plates.

BLAINVILLE de Manuel d'Actinologie; Paris, 1834, 8vo, plates. *Dictionnaire des Sciences Nat.*, Vol 60, 1830.

CALCEOLARI, Francis.—*Museum Descrip. a A. Chiocco et A. Ben. Cerutto*. Verona, 1622, folio, with numerous excellent plates.

CATESBY, Mark.—*Nat. Hist. Carolina, &c.* London, 1731, fol, plates; a German edition, Luxemburg, 1750.

CALLEVILLE, J. B. Calleau.—*Tableau de la Mer. Baltique*.

CAVOLINI, Filippo.—*Memorie per Servire alla Storia de Polypi Marini*. Naples, 1785, 4to, with numerous exact plates.

CHIAJE, Delle.—*Anim. s. Vert.* Naples, 1829; alt. scrip., 1841.

CHABREI, Dominici.—*Stirpium Icones et Sciagraphia*. Geneva, 1766, fol, plates, which are the same as those in Bauhini's work.

CLUSIUS, Charles.—*Atrebatis, &c., Rar. Plant. Historia*; *Antwerp*, 1601, fol, plates; *Exoticorum Animalium*, lib. 10, cum obser., P. Bellonii, obs. *Antwerp*, 1605, fol, plates.

COUCH, R. Q.—*Ann. Nat. Hist.*, Vol. 15, p. 161; *An Essay on the Zoophytes of Cornwall*; *Ninth Ann. Rep. Cornw. Polytech. Soc.*, 1841, p. 27, 1841, 8vo.

COSTE.—*Polyp. Fluviatile*; *Comp. Rendu Acad. Sciences*, Vol. 12, 1841, p. 724; and *Edinb. New Phil. Journ.*, Vol. 32, 1842, p. 70.

CARTER.—*Ann. Nat. Hist.*, 1859, p. 331.

CUVIER, G.—*Anatomie Comparée*. Paris, 1800, 8vo.

DANA, James D.—*Geog. Dist. of Zooph.*; *Edin. New Phil. Jour.*, Vol. 43, 1847, p. 41; *Fror. Nat.* 3. Reibe, Vol. 3, 1847, p. 21; *Ann. Nat. Hist.*, 1847, p. 98.

- DENON, Vivant.—Travels in Egypt. Paris, 1803, 4to, plates.
- DEFRANCE.—Tabl. des Fossiles. Paris, 8vo, 1824.
- DESMAREST AND LESUEUR.—Mem. on some Fossil Cellepores ; Bulletin Philomatique. Paris, 1814, 4to, plates.
- DESLONGCHAMPS.—Dict. Sc. Nat. Art Polyp., &c., &c. Paris, 1816-30.
- DESOR, E.—Bryozoa from Nantucket ; Proc. Boston ; Nat. Hist., Vol. 3, 1848, p. 66.
- DICQUEMARE.—Jour. de Physique, Vol. 28, 1786, p. 429.
- DICTIONNAIRE des Sciences Medicales par une Societé de Mediciens et de Chirurgiens. Paris, 1812, 8vo, plates.
- DONATI, Vitalian.—Saggio d. Storia ; Nat. Marina dell Adriatico. Venice, 1750, 4to, plates.
- DUMERIL, A. M. C.—Zoologie Analytique. Paris, 1806, 8vo, plates ; and Traite Elem. d'Hist. Nat., 1807, 8vo, plates.
- DURAND, J. B. L.—Voyage to Senegal. Paris, 1807, 8vo, Vol. 1, p. 314.
- DUMORTIER, B. C.—On the Anatomy and Phys. of Polypes ; Bulet. de l' Acad. of Brussels, Vol. 2, 1835, p. 422 ; Fror. Nat., Vol. 49, No. 1069, 1836, p. 193 ; 1070, p. 211 ; also, Nouv. Mem. d'Acad. de Brux., Vol. 16, 1843 ; l'Institut, 4, 161, 1836, p. 183 ; also, Ausz in Isis, 1837, p. 770.
- EDWARDS, G.—Nat. History of Birds and Gleanings of Nat Hist. Lond., 1745-58 (translated into French), 4to, plates.
- EHRENBERG.—Corallenbanke des Rothen Meeres, 1832 ; Coral-lenthiere des Rothen Meeres, 4to, 1854.
- ELIEN, C.—De Nat. Anim., libri 17 (in Greek and Latin, with notes of Abraham Gronow) ; Lond., 1644, 4to ; Second edit. of Schneder, 1784, 8vo.
- ELLIS.—Essay on the Nat. Hist. of Corallines ; London, 1755 ; also, Phil. Trans., Vol. 48, pp. 115, 305, 504, 627 ; Vol. 50, pt. 1, 188-280 ; also, Ellis and Solander—Natural His. of many Curious and Uncommon Zoophytes, 1 vol., 4to, 1786.
- ESPER, E. J. C.—Die Pflanzenthiere. Nuremberg, 1791-97, 5 vols., 4to, plates.
- ETTMULLER, Michael.—Coralliorum Tincturæ Examen. Leipsic, 1665, 4to.
- FABRICIUS, O.—Fauna Grœnlandica, 8vo. Copenhagen, 1780.
- FARRE, A.—Phil. Trans., 1837 ; Obs. on Structure and Natural Arrangement, p. 387 ; also, Ann. Nat. Hist., passim.
- FLEMING, Dr.—Hist. Brit. Animals, 8vo. Edinburgh, 1828.
- FORSKAL, Peter.—Icones Rerum Naturalium. Copenhagen, 4to, plates.
- FORTIS, Abbé.—Voyage en Dalmatie. Berne, 8vo, plates, 1778, Vol. 1, pp. 217, 218, 225, 236 ; Vol. 2, p. 244.
- FOURCROY and VAQUELIN.—Ann. du Museum, p. 354, Vol. 18, 1811.

- FREYCINET.—Voyage Autour du Monde. Paris, 1812.
- GANSIUS, J. L.—Coralliorum Historia. Frankfort, 1630-39, 8vo.
- GARDUCIERES, DE, Theoph.—On the Virtues and Effects of Coral. London, 8vo, 1676.
- GALEOTTI.—Mem. del' Acad. de Bruxelles, 1837, &c.
- GERARD, John.—Herbal ; or, Gen. Hist. of Plants. London, 1633, fol, plates.
- GERVAIS, P.—This author has written very extensively on f.w. Polyzoa since 1836. His writings can be found principally in Comp. Rend. Acad. Sc., Vol. 3, 1836, p. 796 ; l'Institute, No. 190, p. 433 ; No. 258, p. 398 ; No. 311, p. 435 ; No. 267, p. 42 ; also, Soc. Philom., 1838, p. 129, besides many other papers, essays, &c.
- GESNER, C.—De Rerum Fossilium. Zurich, 1565, 8vo, plates.
- GINANI, Count G.—Istoria d. Piante Marini. Venice, 1755, fol, plates.
- GMELIN, Jo. Frid.—Systema Nat. Car. Linne, edit. 13. Leipsic, 1788.
- GOLDFUSS.—Petrefacta Germaniæ, 8 parts, folio, 171 plates, 1827 to 1844.
- GOTTWALL, Jo. Christ.—Masli Testaceorum. Nuremb, 1782, fol.
- GRANT, Edinb.—New Phil. Jour., 3, pp. 111 and 337.
- GUERIN DE MENNEVILLE.—Iconographie du Regne Animal ; 1830, 39 plates.
- GUALTIERI, N.—Index Testarum. Florence, 1742, large fol, 110 plates.
- GUETTARD, J.—Mem. sur Sciences et Arts. Paris, 1768-83, 5 vols., 4to, plates.
- HASSELQUIST.—Travels in the Levant, translated into many languages, *vide* Paris edit., 8vo, 1769, Vol. 1, p. 255.
- HASSAL, A. H.—Catal. of Irish Zoophytes ; Ann. Nat. Hist., Vol. 6, 1841, p. 166 ; Vol. 7, 1841, pp. 276, 363, 483 ; and other papers.
- HATCHETT, C.—Phil. Trans., 1800, p. 327.
- HAGENOW, F. V.—Bryoz, Maestrichter Kreidebildung. Cassel, 1851, 12 plates.
- HAIME, J.—Descrip. Bryozoaires Fossiles de la Formation Jurassic, 6 plates ; Mem. Soc. Geologique de France, second ser., Vol. 1, 1854, p. 157.
- HANCOCK, A.—On Anatomy f.w. Bryozoa ; Ann. Nat. His., Vol. 5, 1850, p. 173.
- HINCKS, Rev. Thos.—Rep. Brit. Ass., 1852, p. 75 ; Ann. Nat. Hist., from 1870, passim. This writer has described many Australian species.
- HOGG, J.—Ann. Nat. Hist., Vol. 4, 1840, p. 364.

- HUDSON, W. G.—*Flora Anglica*. Lond., 8vo, 1798.
- HUMBOLDT.—*Vues des Cordilleras*; Paris, 1816, 8vo, plates; Vol. 2, p. 218. *Voyages*; Paris, 1816, 8vo.
- HUGHES, G.—*Nat. Hist. Barbadoes*. Lond. 1750, 8vo, plates.
- HUXLEY, T. H.—*On Cheilostomatous Polyzoa*; *Quart. Jour. Micros. Soc.*, Vol. 4, 1856, 191. See generally the writings of this author, too numerous to specify.
- IMPERATO, F.—*Historia Naturale*. Venice, 1672, fol, plates.
- ISIDORE, St. (a Spanish bishop).—*De Plantis*. Mantua, 1559, fol.
- JOHNSON, Dr.—*Brit. Zoophytes*, second edit., 2 vols., 8vo, plates; London, 1847. This work may be carefully perused, and will afford an immense amount of information, biographical as well as zoological, all written in a charming way. He is the author of many papers, &c., too numerous to specify.
- JONES, Th. Rymer.—*Art Polypifera* in *Todd's Cycloped. of Anat. and Physiol.*
- JUSSIEU, Bern.—*Examen de Productions Marinis, &c.*; *Mem. Acad. Scien.* Paris, 1742, p. 290.
- Jour. Geological Soc.*, London, *passim*.
- Jour. Linn. Soc.*, *passim*.
- Jour. Geograph. Society*.
- KING.—*Ann. Nat. Hist.*, 1846, 18, p. 237.
- KROHN, A.—*Organe bei den Bryozoen*; *Fr. N. Nat.*, Vol. 25, No. 533, 1843, p. 70.
- KÖLLIKER.—*Randkorper d. Quallen*; *Polypen u Strahlthiere*; *Fr. N. Nat.*, V. 25, 534, 1843, p. 81.
- KNORR, G. W.—*Deliciæ Nat. Selectæ*. Nuremberg, 1754-67, fol, plates.
- KRIEGER, A.—*Dissert de Spongiarum*. Leipzig, 1734, 4to.
- LABILLADIERE.—*Voyage a la Recherche de Lapeyrouse*, 8vo, 2 vols., with atlas; Paris, 1799, 44 plates, of which 14 are botanical; also, *Sertum. Austro-Caledoneum*; Paris, 4to, 84 plates, 1824-25.
- LAMARCK.—*Phil. Zoologique*; Paris, 1801, 8vo. *Système d'Animaux, S. Vert.*; Paris, 1801. *Cours de Zoologie*; Paris, 1812. *Sur les Polypiers Empates*; *Ann. du Mus.*, Vol. 20, 1813; *Sur les Polypiers Corticifères*; *Mem. du Mus.*, Vol. 1, 1815, pp. 401, 467; Vol. 2, 1815, pp. 76, 157, 227.
- LAMOUREUX, M. J. V.—*Essai sur les Thalassiphytes*; Paris, 1813, 4to, plates. *Hist. d. Polypiers Flexible*; Caen, 1816. *Expos. Methodique*, 1821.
- LANDSBOROUGH, D.—*Edin. N. Phil. Jour.* Vol. 32, 1842; p. 169; *Ann. Nat. Hist.*, Vol. 8, 1842, p. 257.
- LEEUWENHOCK.—*Phil. Trans.*, Vol. 26, 1708, p. 126.
- LESEBLE, O.—*Hist. Gen. Bryozoaires*. Tours, 1859, 8vo.
- LEIBOLD, F.—*Beiträge zur Naturgeschichte der Polypen*. Dresden, 1847.

LESSON.—Hist. Nat. der Zooph. der Voyage du Coquille. Paris, 1832, plates.

LEIDY, Jos.—On some American f.w. Polyzoa; Proc. Acad. Nat. Sc. Philadelphia, Vol. 5, 1851, p. 320.

LISTER, Jos. T.—Structure of Polypi, &c.; Entomol. Mag., Vol. 3, 1836, p. 172.

LINNE, Car.—Hortus Cliffortianus; Amsterdam, 1737, fol, plates. Corallia Balthica, 1745, 4to, plates. Mus. Tessianum; Stockholm, 1753, fol, plates—pl. 10, 11, and 12 have figures of Polyzoa. Fauna Suecica, ed. 11; Stockholm, 1761, 8vo. System Nat., 10 to 12 edit.

LHWYD, or LLOYD.—Philos. Trans., Vol. 28, p. 71.

LIEBKNECHT.—Hessiae Subterraneae Specimen. Hesse Cassel, 1750, 4to, plates.

LUDWIG, C. G.—De Veg. Plant. Marinarum. Leipzig, 1736, 4to, 1 plate.

LOBEL, M. De.—Icones and Stirpium. Antwerp, 1591, 4to, plates.

LONSDALE.—Quart. Journ. Geol. Soc. London, Vol. 1, 1845, p. 65.

MACDONALD, J. D.—Proc. Roy. Soc.; Lond., Vol. 8, 1857, p. 383. Ann. Nat. Hist., Vol. 19, 1857, p. 390.

MACLAREN, C.—On Coral Islands; Edinb. Phil. Jour., 34, 1843, p. 33; Remarks of C. Darwin on the same, p. 47.

MANZONI, Bryoz. Foss. Ital.—Sitzungsb. d. Kais. Akad. d. Wissensch., Vol. 61, 1 Abth., 1870.

MACGILLIVRAY, P. H.—Cheilostomatous Polyzoa of Victoria and other parts of Australia; Trans. Roy. Soc. Victoria, 1860, p. 168, plate 3.

MALTEBRUN.—Annales des Voyages. Paris, 8vo, Vol. 1, p. 105; Vol. 19, p. 158.

MARSDEN, Will.—Hist. of Sumatra. London, 1784, 4to, plates.

MARSILLI, Count De.—Hist. Physique de la Mer. Amsterdam, 1725, fol, plates.

MAZZOULLI, F. M.—Diss. de Corall. Mem. di diversi. Valent, Vol. 1, 1743, p. 123.

MEYEN, F. J. F.—Natur. der Polypen in Isis, 1828, p. 1225.

MELTZER, C. D.—De Coralliis Dissertatio. Koenigsberg, 1728, 4to.

MERRET, C.—Pinax Rerum Nat. Brit. London, 1667, 8vo.

MILBERT.—Voyage a l'Île de France. Paris, 1812, Vol. 1, p. 226; Vol. 2, pp. 26, 34, 301.

MOLL, J. P. C.—Eschara ex Zoophytorum, &c. Vienna, 1803, 4to, plates.

MORANDI, J. B.—Historia Botanica. Milan, 1744, fol, plates.

MORRIS, R.—Plantarum Hist. Universalis. Oxford, 1715.

MULLER, D. Fred.—*Zoologica Danicæ Prod.* Copenhagen, 1776, 8vo; also 1788 to 1806, fol, plates.

MULLER, John.—*Zoophyten, &c.*; Dessen Archiv. f. Anat. und Phys., 1858, p. 90.

MILNE, Edwards.—*Hist. Nat. de Cor.*, 3 vols. Paris, 1854. Besides a large number of Memoires and the revision of the Polyzoa in Deshayes, second edit. of Lamarck.

MEMOIRES de la Soc. Nat. de Paris.

M'COY, F.—Various Memoirs and Papers on Palæontology, &c., too numerous to specify.

MUSEUM RICHTERIANUM. Leipsic, 1743, fol, plates.

MICHELIN.—*Iconographie Zoophytologique Descrip. des Polypiers Fossiles de France, &c.*, 5 livrasons, 1841-42, Paris, plates.

MOLINA.—*Hist. Nat. d. Chili*, 8vo, 1789, Paris.

MORREN, C.—*Descrip. Coral Foss. in Belgio Repert*, 1828.

NARDO, G. D.—*Nuovo Classif. dei Zoofiti*; *Atti della Riun. Scienz*; Ital, 1843, p. 43; *Isis*, 1845, p. 635. Also, *Nuov. Ann. delle Scienz Nat*; Bologna, 2 ser., Vol. 3, 1845, p. 104; Vol. 2, 1844, p. 460. Published separately Vicenza, 1845.

NIEREMBERG, J. E.—*Hist. Naturæ.* Antwerp, 1835, fol.

NORDMANN, Av.—*Susswasser Polypen von Paris, &c.*; *Bull. Sc. Acad., St. Petersburg*, Vol. 8, 1841, p. 353.

NYST, P. H.—*Coquilles et Polypiers Fossiles de Belgique.* Bruxelles, 1843, 4to, with atlas.

Ocean Flowers and their Teachings. Both anonymous; 8vo, 1846.

ORBIGNY, Alcide D'.—*Recherches Zool. sur Mollusques Bryozoaires*; *Rev. et Mag. Zool.*, 2 ser., Vol. 1, p. 499; Vol. 2, p. 108. *Ann. Sc. Nat.*, 3 ser., Vol. 16, 1851, p. 292; Vol. 17, 1852, p. 273.

OTTO, A. W.—*Neuen Mollusken and Zoophyten in Isis*, 1824, p. 626.

OLAFSEN and POLVESEN.—*Voyage en Iceland.* Paris, 8vo, 1802.

OLEARUS, A.—*Museum Gottorfische Künstkammer.* Sleswick, 4to, 1666, plates

OLIVI, Abbé Giuseppe.—*Zoologica Adriatica.* Bassano, 1792, 4to, plates.

PALLAS, Dr. P. S.—*Elenchus Zoophytorum*; Lahaye, 1766, 4to, plates. Also, *Voyage d. l. Russie Merid*; Paris, 1805, Vol. 2, pp. 50, 520, 631.

PARKINSON, J.—*Theatrum Botanicorum.* London, 1640, fol, plates.

PARKINSON, J. C.—*Organic Remains*; London, 1820. Fossil Fruits, no date.

PARSON, J.—*A Letter concerning the Formation of Coral*, Vol. 47, p. 505.

PERON.—Mem. de l'Institute de France, Sept., 1798.

PERON and LESUEUR.—Voyage aux Terres Australes. Paris, 4to, plates, 1807, pp., 56, 146.

PETIVER, J.—Gazophylacii Naturæ, Dec. 10; London, 1702, fol, plates; and Museum Petiverani, 1703, 8vo. Petrigraphia Americana; Icones, 1762, fol, plates. Plant. Marinarum, 1715, fol, plates; Description of Corals sent from the Philippines; Phil. Trans., No. 206.

PEYSSONNEL, DE.—Philosoph. Transactions, Vol. 47, p. 445; published separately. London, 12mo, 1756.

PHIPPS.—Voyage au Pole. Paris, 4to, plates, p. 202, pl. 13.

PICTET, F. J.—Paleontologie. Paris, 1857, 4 vols. and atlas, 8vo.

PLANCHI, J.—De Conchis; Venice, 1739, 4to, plates, second edit.; Rome, 1760, 4to, plates. Epist. ad Junellium Act Acad. Sinensis, Vol. 2.

PLINY, C.—*Histor. Mundi*. Bohn's trans. edit.

PLUNKETT, L.—Phytographia; London, 1791, 4to, 328 plates. Almagetum Botanicum; London, 1696, 4to; Mantissa, 1700, with 32 additional plates.

POIRET, J. L. M.—Voyage en Barbarie; Paris, 1802, 8vo, Vol. 2, p. 45. Encyclopedie Methodique, part; Botan. par Lamarck continuée par Poiret.

POMET.—Hist. Gen. de Drogues. Paris, 1694, fol, plates.

PONTOPPIDAN, E.—Hist. Nat. Norway. Copenhagen, 1752, 8vo, plates.

PHILLIPS, J.—Figures and Descrip. of Paleoz. Fossils of Cornwall. London, 1841, 8vo, plates.

POURTALES, Count De.—Floridian Bryozoa, pt. 2, p. 69; Reports published by American Government, 1870, &c.

PROUT, H. A.—Carboniferous Bryozoa; Trans. Acad. St. Louis, Vol. 1, 1857, p. 235, second ser., p. 266.

POLEN.—Paleontologie, 4to, plates, 1837.

QUOY and GAIMARD.—Voyage de l'Astrolabe; Zoologie passim, Atlas; Paris, 1841. Ann. d. Sciences Nat., Vol. 6, 1825, pp. 174, 273; Vol. 14, 1828, p. 236; Isis, 1830, p. 318. Bull. Soc. Philomat, 1823, p. 119.

RAY, J.—Hist. Plantarum; London, 1686 to 1704, 8vo, plates. Synopsis, Meth. Stirpium, 1724; posthumous (Ray died in 1704).

ROUSSEAU, L.—Zoophytes du Voyage au Pole, Sud. Zool., Vol. 5, 1854, Paris.

RAMOND, L.—Voyages dans les Pyrenées. Paris, 1801, 8vo, plates. This work gives the description of many fossil corals and polyzoa.

REAUMUR, M.—Observations on Coral; Mem. de l'Acad. Roy. d. Sciences, 1727, p. 39.

- RENEALM, P.—Specimen Hist. Plantarum. Paris, 1611, 4to.
- RENIER, S. A.—Lettera Sopra il Botrillo, 10 Mars, 1793, Chiozza, 4to, plates.
- RASPAIL.—Isis, 1832, p. 1. (answers to Meyen on f. w. Polypes).
- REUSS, A. E.—Fossile Polyparen des Wiener Tertiär Beckens Sitz. d. Kais. Akad. d. Wiss., Vol. 2.
- RISSO.—Hist. Nat. des Prod. d'Europe, 5 vols., 8vo, 1826.
- RONDELET, G.—Universæ Aquatiliū Historiæ. Lyon, 1554, 4to, plates.
- Royal Society, Tasmania—Proceedings.
- Royal Society, Victoria.
- Royal Society, New South Wales.
- RUMPHIUS, G. E.—Amboynsche Rariteytkamer; Amsterdam, 1741, fol, plates. Herbarum Amboinense; Amsterdam, 1741, fol, plates. Obser. in Miscel. Nat. Curiosorum.
- RUYSCH, H.—Theatrum Universale Omnium Animal. Amsterdam, 1718, fol.
- SCHWENCFELTIUS, G.—Stirpium et Foss.; Silesium Catalogus. Leipsic, 1600, 4to.
- SCHWEIGGER, A. F.—Observations on Coraline; Edinb. New Phil. Jour., Vol. 1, 1826, p. 220; Jour. de Phys., Vol. 16, p. 213; Lichtenbegg's Mag., Vol. 1, p. 208.
- SEBA, A.—Thes. Rerum Naturalium. Amsterdam, 1734, fol, plates.
- SHAW, M. T.—Travels in the Levant. Oxford, 1738, Vol. 2, p. 124.
- SHAW, G.—Trans. Linn. Soc. Lond., Vol. 5, p. 227, 4to, plates.
- SIBBALD, R.—Scotia, illustrata, fol, plates. Edinburgh, 1684-96.
- SLOANE, Sir Hans.—Catalogus Plantarum, Jamaica; London, 1696, 8vo. Phil. Trans., Vol. 44, 478.
- SMITT, Floridan.—Bryozoa, part 2, p. 67, pl. xiii., fig. 245-254.
- SONNINI, C. S.—Voyage dans la Haute et Basse Egypte; Paris, 1799, 8vo. Voy. en Greece and Turkey; Paris, 1801, 8vo, Vol. 1, p. 208; Vol. 2, p. 218.
- SPALLANZANI, Abbé.—Letter to C. Bonnet; Journ de Physique, Vol. 28, 1786, 4to.
- TARGIONI, T. J.—Voyage Mineral. Phil. en Toscane. Paris, 1792, 8vo.
- TEICHMEYER, De.—Coral Rub. Jena, 1734, 4to.
- TEMPLETON.—Mag. Nat. Hist., 467; and other papers in the Meth. Journal and Ann. Nat. Hist.
- TENISON-WOODS, J. E.—Proc. Roy. Soc., Victoria, 1865; Geol. Obs. in S. Austral.; Proc. Roy. Soc., Tas., 1876; Proc. Roy. Soc., N.S.W., 1876, '77, '78; Jour. Geol. Soc., Lond., 1859; Proc. Phil. Soc., Adelaide, 1879; Proc. Linn. Soc., N.S.W., 1878-79.

THOMPSON, Sir W.—Deep S. Soundings, Voyage of "Challenger;" and Ann. Nat. Hist., Vol. 253.

THOMPSON, J. V.—Zool., illust.; Mem., V. 92, 1830, 98, pl., 3 fig.

THUNBERG, C. P.—Voyage en Japan. Paris, 1796, 8vo; Paris, Vol. 3, p. 438.

TORRUBIA, J.—Hist. Nat. Espanola. Madrid, 1754, 4to, plates.

TOURNEFORT, J. P.—Obs. sur les Planules dans le fond de la Mer.; Mem. Acad. Sciences. Paris, 1700, p. 27.

TREMBLY, A.—Phil. Trans., Vol. 42, p. 467; 43, p. 469; 44, p. 474; also, Mem. sur Polypes d'eau douce. Leyden, 1744, 4to, plates.

TURGOT.—Mem. d' Hist. Nat. Lyon, 1751, 8vo, plates.

TURNER, Dawson.—Fuci Descrip. et Icones. London, 1808, 4to, plates.

TURTON, W.—Linnæus, 7 vols.; London, 8vo, 1806, plates. Fauna Brit., London.

TREVIRANUS.—Voight's Magazine, Vol. 7, 1804, p. 21.

VALENTIA, Viscount G.—Voyages through Hindustan and Ceylon. Paris, 1813, Vol. 2, pp. 202, 206, 214, 220, 243; Vol. 3, p. 29; Vol. 4, pp. 291, 306, 313, 329.

VAN BENEDEN.—Too numerous to specify, but see Ann. Nat. Hist., passim, 1846, 18.

VALENTYN, F.—Collection de Voyages. Amsterdam, 1724, fol, plates.

VANCOUVER.—Voyages. Paris, 1802, 8vo.

VAUCHER, C.—Bullet. Philom., No. 81, p. 157. Paris, 1804, 4to, plates.

WOOD, S. V.—Ann Nat. His., Vol. 13, p. 17.

WOLFART, P.—Hist. Nat. Hassiæ Inferioris. Cassel, 1718, fol, plates.

WORMIUS, O.—Mus. Wormianum. Amsterdam, 1655, fol, plates.

ZANICHELLE, Isteria delle Pianté, and Museo Zanichelliano; Venice, 1736, 4to. Epistolo de Myriophyllo; Venice, 1714, 8vo.

ZIEGRA, Esercitato—Physica de Zoophytis; Witteberg, 1667, 4to.

ZOOLOGY, Quarterly Journ. Microscop. Science, Vol. 3, 1855, 4 plates, pp. 253, 256, 320, 322; Vol. 4, 8 plates, pp. 93, 96, 176, 180, 308, 312; Vol. 5, 1857, 5 plates, pp. 24, 172, 242; Vol. 6, p. 124, 2 plates; Vol. 7, 1859, pp. 65, 143, 2 plates.

ZOOLOGICAL SOCIETY, Proceedings of.—A few notices in the later volumes.

I have omitted the name of J. E. Gray from this list, whose writings on Nat. Hist. are so voluminous, and who, amongst other departments, wrote on the Polyzoa, especially in Dieffenbachs, N. Zealand. Appendix.

There are few of my readers who will not be able to suggest additions to this list in the writers of the last ten years, especially in the *Annales Sciences Naturelles*, the *Annals of Natural History*, and the *American Journal of Science and Art*, the *Geological Magazine*, &c. I must add, also, that I did not propose to refer to any but new observations, so I make no reference to *Nature*, the *Pop. Science Review*, and similar serials. I need scarcely remark that a large number of the works quoted have not been seen by me, though I have been fortunate in seeing an unusual number of the older ones. I can never say enough in praise of the value and use of the figures and descriptions of some old and almost forgotten authors; and I have seen new reason every day for verifying every authority, no matter how trustworthy the author. It is related of the celebrated patriotic scholar, Dr. Martin Routh, that when asked for some important and valuable principle as a result of all his literary experience, his reply was, "Verify your references." A more important principle in scientific literature can scarcely be imagined. Let me hope that my imperfect labour in the foregoing list may help the student in this way.
